

ELONGATE RETAINING ELEMENT FOR BUILDING SHEETS

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GB368043
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Abstract of WO9853158

An elongate retaining element for building sheets has, as seen in cross section perpendicular to its direction of elongation, a head part (1) for engaging at least one building sheet, a base (4) for mounting the retaining element on a support structure and a connecting flange (2) extending upwardly from the base (4) and joining the head part (1) to the base (4). To allow relative mobility of the sheet and the support structure, the connecting flange (2) is attached to the base (4) by a connection permitting rotation of the connecting flange (2) and the head part (1) relative to the base (4) about an axis parallel to said direction of elongation of the retaining element (Fig. 3b).

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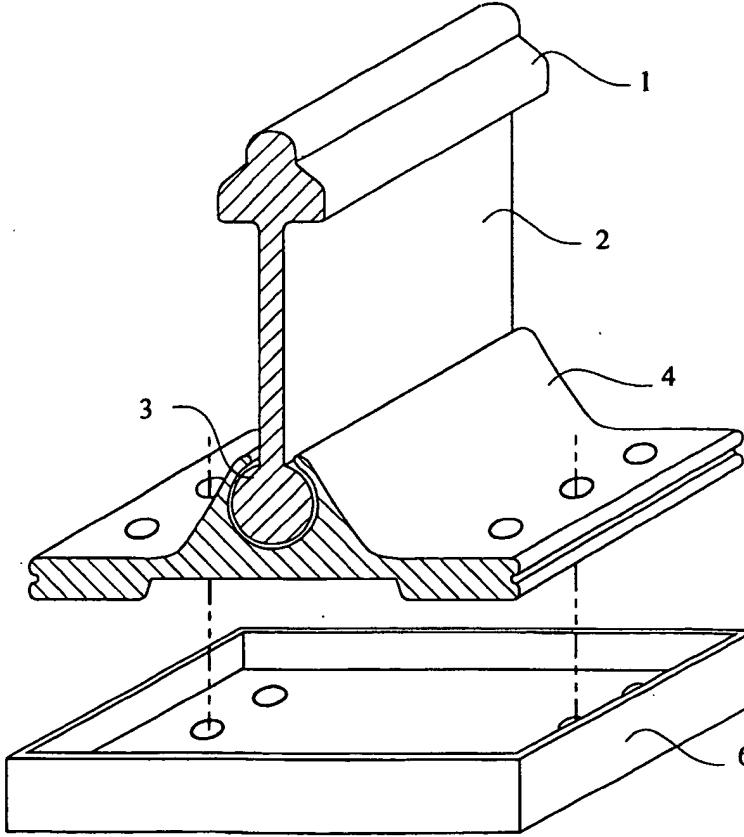
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(54) Title: ELONGATE RETAINING ELEMENT FOR BUILDING SHEETS

(57) Abstract

An elongate retaining element for building sheets has, as seen in cross section perpendicular to its direction of elongation, a head part (1) for engaging at least one building sheet, a base (4) for mounting the retaining element on a support structure and a connecting flange (2) extending upwardly from the base (4) and joining the head part (1) to the base (4). To allow relative mobility of the sheet and the support structure, the connecting flange (2) is attached to the base (4) by a connection permitting rotation of the connecting flange (2) and the head part (1) relative to the base (4) about an axis parallel to said direction of elongation of the retaining element (Fig. 3b).



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ELONGATE RETAINING ELEMENT FOR BUILDING SHEETSFIELD OF THE INVENTION

The invention relates to an elongate retaining element for engaging building sheets to retain them in place on a support structure of a building. Typically the retaining element has a head part engaging a shaped rib of the building sheet and a base which is to be fixed to the support structure by connecting elements, e.g. screws. The invention further relates to an assembly of at least one such retaining element and at least one building sheet mounted thereby on a support structure.

DESCRIPTION OF THE PRIOR ART

GB-A-2167101 discloses elongate retaining elements for mounting building sheets whose free ends are flanged into upstanding connecting ribs on a supporting structure of a building, such as for example supporting beams, T-bearers or similar structural elements manufactured from for example wood, steel, aluminium or concrete. One form of retaining element of this prior publication is illustrated in Fig. 1. It is manufactured in one part, e.g. as an aluminium extrusion, and can be connected to the support structure using connecting elements such as screws passed through drilled holes in its base. Another retaining element illustrated in GB-A-2167101 has a base of thermally insulating material such as thermoplastics acting as a spacer member. The base has centrally

located holes for securing screws and at its upper side a wide recess with overhanging side flanges retaining a base part of the aluminium extrusion which has an upstanding web carrying the enlarged head which engages 5 the building sheet. The extrusion is therefore longitudinally adjustable in the base but appears to be clamped by the overhanging side flanges. Another drawing shows the aluminium extrusion similarly retained on a base of aluminium which is itself retained on a spacer 10 member of plastics material.

The arrangements shown in GB-A-2167101 do not fully deal with the disadvantages which arise in use when the effects of particularly the weather cause the building sheets to expand or contract, so that a high mechanical 15 loading may act on the base of the retaining element and the connecting elements, e.g. screws. With an excessive mechanical loading or after a certain standing time under high dynamic loads the retaining element or the connecting screws can crack through or break off.

20 Moreover, the building sheets sliding over the head part under the effect of a cyclic thermal expansion can cause an unpleasant noise as the metal parts slide over one another. A further disadvantage is that a high mechanical loading on the retaining element or the 25 connecting screws is undesired where the retaining element is attached to a less usual and brittle support structure, such as for example insulating glass wool of a

high density or foam glass, so that over time the join between the retaining element and the support structure no longer meets requirements.

SUMMARY OF THE INVENTION

5 In order to remove or at least diminish these drawbacks, it is an object of the invention to improve the elongate retaining element in such a way that it can fulfil its function of supporting and connecting a building sheet or sheets to the support structure even

10 where varying forces act, so that the join with the support structure continues to meet requirements. A further object of the invention is to reduce the risk of the occurrence of the unpleasant noise of the building sheets and the head part sliding over one another.

15 According to the invention, there is provided an elongate retaining element for building sheets, having, as seen in cross-section perpendicular to its direction of elongation, a head part for engaging at least one building sheet, a base for mounting the retaining element

20 on a support structure and a connecting flange extending upwardly from the base and joining the head part to the base. The retaining element is characterised in that the connecting flange is attached to the base by a connection permitting rotation of said connecting flange and said

25 head part relative to said base about an axis parallel to said direction of elongation of the retaining element.

This achieves the effect of making possible a

relative movement between the head part of the retaining element and the support structure, in the lateral direction of the retaining element and, as described below, preferably also in the longitudinal direction.

5 This relative movement allows the join of the retaining element to the support structure to be considerably less mechanically loaded under the effect of cyclical thermal expansion of the sheet-like building elements. It also achieves the effect of reducing the occurrence of the

10 unpleasant noise of metal parts sliding over one another.

An advantage therefore is that the retaining element may be used for fixing sheets to a brittle support structure of a type which is less usual in the construction industry.

15 Preferably the connection of the connecting flange to the base permits rotation through a predetermined arc between end stop positions. To give symmetry to the element, this predetermined arc may be symmetrical with respect to a central plane of symmetry of the retaining element. In a preferred form the connection of the

20 connecting flange to the base is in the form of a base portion of the connecting flange and a socket of the base receiving the base portion, the base portion and the socket both being of part-circular shape as seen in

25 cross-section perpendicular to the direction of elongation of the retaining element. The socket may have an open mouth extending over an arc between $-\alpha^\circ$ and $+\alpha^\circ$

with respect to a radial line joining the centre of rotation to the centre of the open mouth where α is not more than 15° .

As mentioned above, preferably the connection of the connecting flange to the base permits also sliding longitudinal movement of the connecting flange relative to the base in the direction of elongation of the retaining element. This achieves the effect that in the joined state the retaining element is not only free to move rotationally but it can also make longitudinal movements, thereby further reducing the mechanical loading on the join to the foundation as a result of the thermal expansion. This embodiment is ideally suited to joining the retaining element to a brittle or a relatively soft and/or less strong foundation than is conventional.

Preferably the connection of the connecting flange to the base comprises means lubricating the relative movement of the connecting flange and the base.

Particularly the lubricating means may be selected from

- (a) a permanent lubricating coating on at least one of respective contact surfaces of the connecting flange and the base,
- (b) an intermediate lubricating member between respective contact surfaces of the connecting flange and the base, and
- (c) use of a self-lubricating metal to provide at least

one of respective contact surfaces of the connecting flange and the base.

Reducing the coefficient of friction achieves the effect that the parts are able to move more easily relative to one another, thereby further reducing the loading on the support. It further achieves the effect of further reducing the chance of undesired noise as a result of metal parts sliding over one another. A lubricating coating based on for example oil or grease is possible, but over time these coatings can dry out so that the lubricating effect reduces. After the sheet-like building elements have been attached, the retaining elements are no longer easily accessible for applying a fresh layer of oil or grease. Various permanent lubricating coatings are available on the market which only need to be applied once on at least one contact surface for attaining a good lubricating action during the entire economic service life of the building element.

The head part may be provided with a permanent lubricating coating. This considerably reduces the friction between the head part and the building sheets and in turn this reduces the chance of the occurrence of the undesired noise of metal parts sliding over one another as a result of thermal expansion. A reduced friction further reduces the mechanical loading on the join with the support.

The head part may be hollow. This achieves the

effect that when in operation a building sheet can be joined to the head part using joining elements such as screws or rivets. This stops the head part moving relative to the building sheet and thereby also stops the 5 occurrence of undesired noise as a result of thermal expansion of the building sheets. Applying the permanent lubricating coating onto the head part may be omitted.

The base portion of the connecting flange may be hollow. This makes it possible, as the building sheets 10 are being placed in position, to place means of positioning for the support element such as for example clamps manufactured from a plastics material.

Preferably the head part and the connecting flange on the one hand and the base of the element on the other 15 are both an extruded section. An extruded section is simple and relatively inexpensive to manufacture.

The retaining element can be manufactured from a metal, and preferably aluminium, or from a plastics material. To a large extent the choice of the material 20 depends on the circumstances of the case. Where high mechanical loading is expected, then metal is preferable, and aluminium in particular, because this metal is strong yet has a low density. Where mechanical loading is expected to be low, a suitable plastics material may be 25 chosen because this is normally less expensive than metal and furthermore it does not need any lubricating coating because many suitable plastics possess self-lubricating

properties. A combination of for example a plastics material support element and a metal retaining element is also possible. An advantage of this is the reduction of the occurrence of a so-called cold crack in the building 5 structure. To avoid this problem a metal support element can be provided with a plastics material cap.

The dimensions in the longitudinal direction of the retaining element may also be varied to depend on the circumstances of the case. For instance, where the 10 support to be used with is relatively soft or brittle, the base may be chosen to be longer relative to the connecting flange in order to obtain a lower pressure on the support.

According to the invention in another aspect, there 15 is provided an elongate retaining element for building sheets, having, as seen in cross-section perpendicular to its direction of elongation, a head part for engaging at least one building sheet, a base for mounting the retaining element on a support structure and a connecting 20 flange extending upwardly from said base and joining the head part to the base, wherein the connecting flange is attached to the base by a connection permitting sliding longitudinal movement of the connecting flange relative to the base in the direction of elongation of the 25 retaining element, which connection is in the form of a recess of the base having overhanging side flanges receiving a base portion of the connecting flange, the

overhanging side flanges of the base define grooves. The element is characterised in that the grooves have parallel opposite faces and the base portion has parallel-sided projections received in the grooves, 5 whereby the base portion is freely slidable along the base. The use of such parallel-sided grooves, and projections received in them, makes the two components unlikely to jam together, so that free longitudinal sliding is easily obtained.

10 INTRODUCTION OF THE DRAWINGS

The invention will now be illustrated by several non-limitative embodiments, with reference to the accompanying drawings, in which:-

15 Fig. 1 shows a known retaining element as described above, in cross-section, together with two building sheets with ribbed edges;

Fig. 2 shows in cross-section an embodiment of the elongate retaining element in accordance with the invention;

20 Figs. 3a and 3b show cross-sections of another embodiment of the retaining element in accordance with the invention in dis-assembled and assembled state, and Fig. 3c shows a modified form of one component of the retaining element;

25 Fig. 4 shows in cross-section enlarged the base component of the embodiment in accordance with Fig. 3;

Fig. 5 shows a perspective view of part of the

embodiment in accordance with Fig. 3.

DESCRIPTION OF THE EMBODIMENTS

Fig. 1 shows schematically a retaining element in one part in accordance with the state of the art 5 consisting of a symmetric head part 1, a connecting flange or web 2 and a base 3 symmetric relative to the central longitudinal plane (ME) of the connecting web 2, wherein the base part has a recess 7 underneath and is provided with holes for fixing means for joining it to a 10 support structure, and wherein the head part 1 cooperates with edge ribs of two building sheets 8 to hold them.

Fig. 2 shows schematically a retaining element of the invention having one component consisting of a head part 1 and a connecting web 2 with a base portion 3 of 15 flat shape symmetric relative to the central longitudinal plane (ME) of the connecting web 2. The second component is a support element or base 4, which is provided with fixing holes 5 in laterally projecting portions. The base 4 has a recess to receive the base portion 3 formed 20 by upstanding flanges which overhang the base portion 3. Parallel-sided grooves, extending laterally, receive the correspondingly parallel-sided lateral portions of the flat base portion 3 with clearance. This type of join allows the connecting web 2 to move freely in its 25 entirety in the longitudinal direction, without risk of jamming or wedging of the base portion 3 in the grooves, under the effect of for example thermal expansion of the

building sheets. Consequently the mechanical loading on the support structure is reduced.

Fig. 3a shows a retaining element in accordance with the invention in which the web 2 and the base 4 are joined by a socket-type joint with a circular cross-section. The base portion of the web 2 is circular and symmetrical relative to the central longitudinal plane (ME) of the web 2, and the head part 1 is hollow. The hollow base portion of the web is received by a partially open circular-section socket of the base 4. These parts are assembled as shown in Fig. 3b. The component 1, 2, 3 can slidingly rotate about a longitudinal axis between end stop positions and slide longitudinally relative to the fixed base 4. Fig. 3c shows a variation in which head part 1 and web 2 of the retaining element in accordance with the invention have a solid cross-section.

Fig. 4 shows schematically the base 4 from Fig. 3a and Fig. 3b, and shows that the open mouth of the circular-section socket extends over an arc, with respect to a radial line between the centre of the mouth and the centre of rotation of the round base portion, through an angle from $-\alpha^\circ$ to $+\alpha^\circ$. The web 2 can thus rotate between defined end stop positions. This small rotation is in addition to the free movement in the longitudinal direction. Preferably α is in a range of up to approximately 15° and more preferably α is no more than 10° .

Fig. 5 shows schematically a perspective view of the embodiment in accordance with Fig. 3, wherein additionally between the support structure and base 4 a plastics tray 6 is fitted to prevent or at least reduce 5 risk of a cold crack during operation.

CLAIMS

1. An elongate retaining element for building sheets, having, as seen in cross-section perpendicular to its 5 direction of elongation, a head part (1) for engaging at least one said building sheet, a base (4) for mounting the retaining element on a support structure and a connecting flange (2) extending upwardly from said base (4) and joining said head part (1) to said base (4), 10 characterised in that said connecting flange (2) is attached to said base (4) by a connection permitting rotation of said connecting flange (2) and said head part (1) relative to said base (4) about an axis parallel to said direction of elongation of the retaining element.

15

2. An elongate retaining element according to claim 1, wherein said connection of said connecting flange (2) to said base (4) permits said rotation through a predetermined arc between end stop positions.

20

3. An elongate retaining element according to claim 2, wherein said predetermined arc is symmetrical with respect to a central plane symmetry of the retaining element.

25

4. An elongate retaining element according to any one of claims 1 to 3, wherein said connection of said

connecting flange (2) to said base (4) is in the form of a base portion (3) of said connecting flange (2) and a socket of said base (4) receiving said base portion (3), said base portion and said socket both being of part-
5 circular shape as seen in said cross-section perpendicular to said direction of elongation of the retaining element.

5. An elongate retaining element according to claim 4,
10 wherein said socket has an open mouth extending over an arc between $-\alpha^\circ$ and $+\alpha^\circ$ with respect to a radial line joining the centre of rotation to the centre of said open mouth where α is not more than 15° .

15 6. An elongate retaining element according to any one of claims 1 to 5, wherein said connection of said connecting flange (2) to said base (4) permits also sliding longitudinal movement of said connecting flange (2) relative to said base (4) in the direction of
20 elongation of the retaining element.

7. An elongate retaining element according to any one of the preceding claims, wherein said connection of said connecting flange (2) to said base (4) comprises means
25 lubricating the relative movement of said connecting flange (2) and said base (4).

8. An elongate retaining element according to claim 7, wherein said lubricating means is selected from

(a) a permanent lubricating coating on at least one of respective contact surfaces of said connecting flange (2) and said base (4),

5 (b) an intermediate lubricating member between respective contact surfaces of said connecting flange (2) and said base (4), and

(c) use of a self-lubricating metal to provide at least 10 one of respective contact surfaces of said connecting flange (2) and said base (4).

9. An elongate retaining element according to any one of claims 1 to 8, wherein said head part (1) has a hollow 15 cross-section.

10. An elongate retaining element according to claim 4 or 5, wherein said base portion (3) of said connecting flange (2) has a hollow cross-section.

20 11. An elongate retaining element for building sheets, having, as seen in cross-section perpendicular to its direction of elongation, a head part (1) for engaging at least one said building sheet, a base (4) for mounting 25 the retaining element on a support structure and a connecting flange (2) extending upwardly from said base (4) and joining said head part (1) to said base (4),

wherein said connecting flange (2) is attached to said base (4) by a connection permitting sliding longitudinal movement of said connecting flange (2) relative to said base (4) in the direction of elongation of the retaining element, which connection is in the form of a recess of said base (4) having overhanging side flanges receiving a base portion (3) of said connecting flange (2) said overhanging side flanges of said base (4) define grooves characterised in that said grooves have parallel opposite faces and said base portion (3) has parallel-sided projections received in said grooves, whereby said base portion (3) is freely slidable along said base (4).

12. An assembly comprising at least one building sheet and at least one elongate retaining element according to any one of claims 1 to 11 engaging said building sheet to retain it on a support structure.

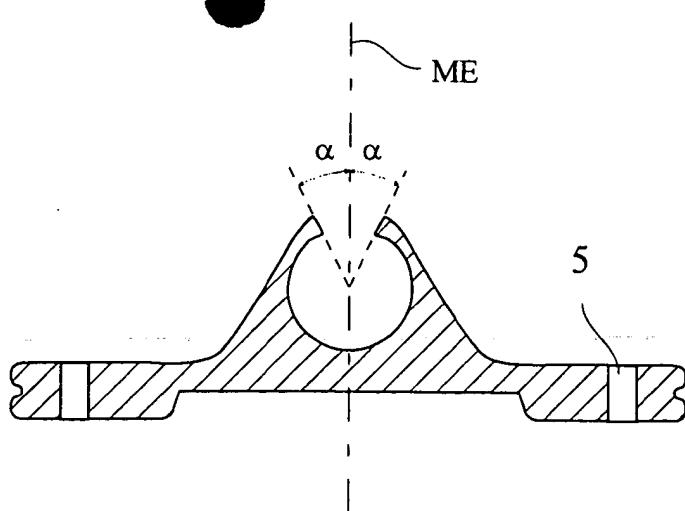


Fig.4

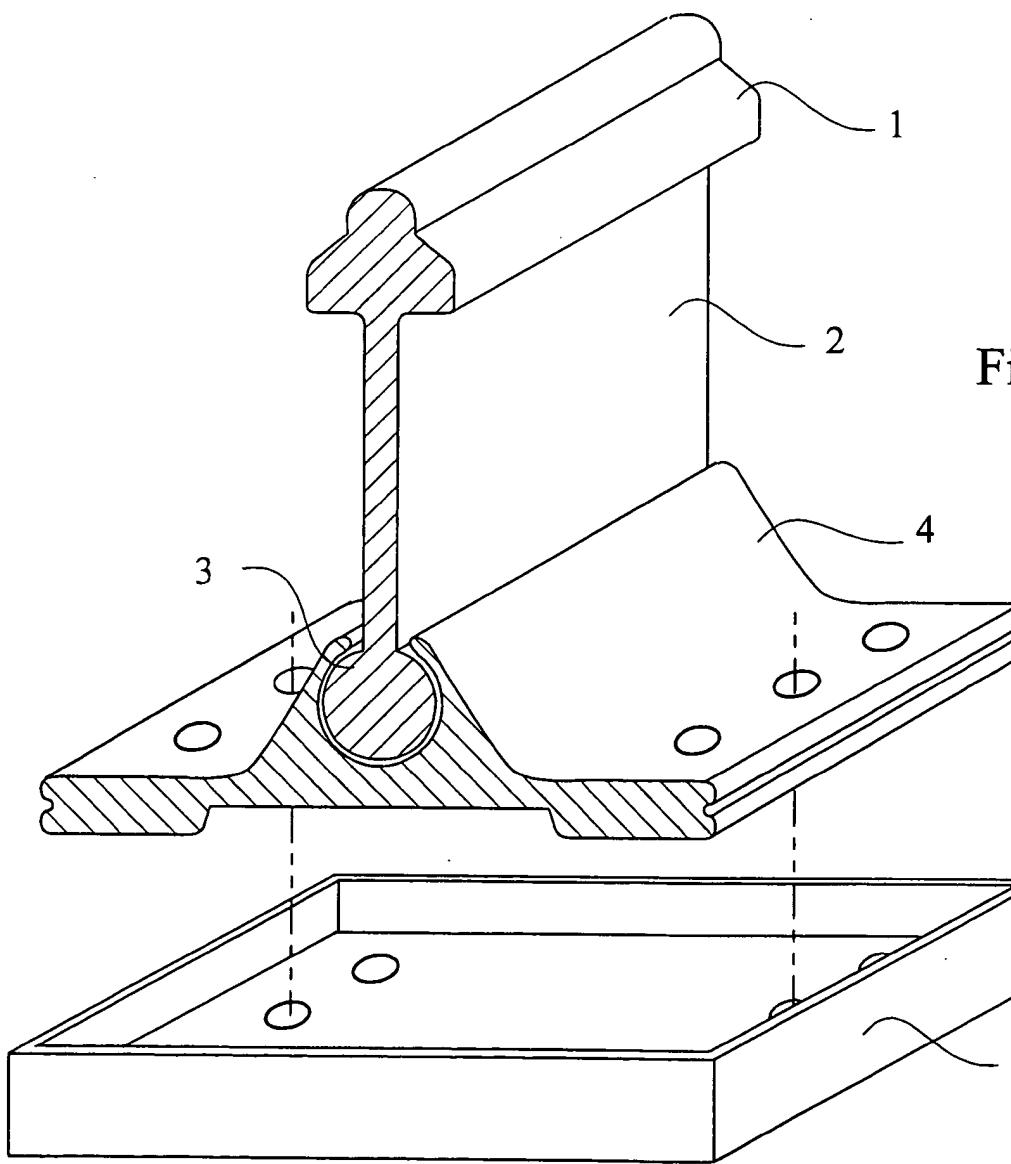


Fig.5

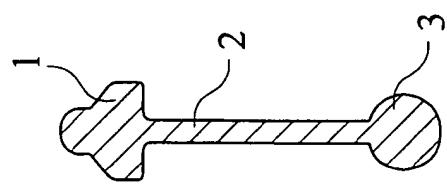


Fig.3c

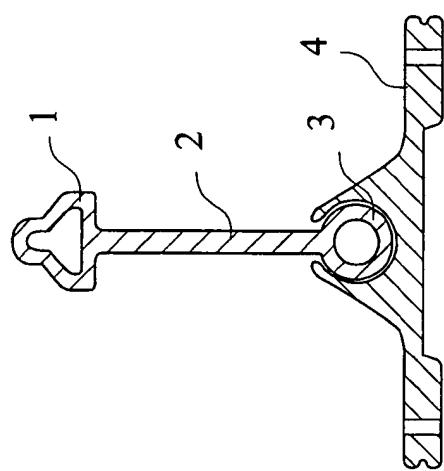


Fig.3b

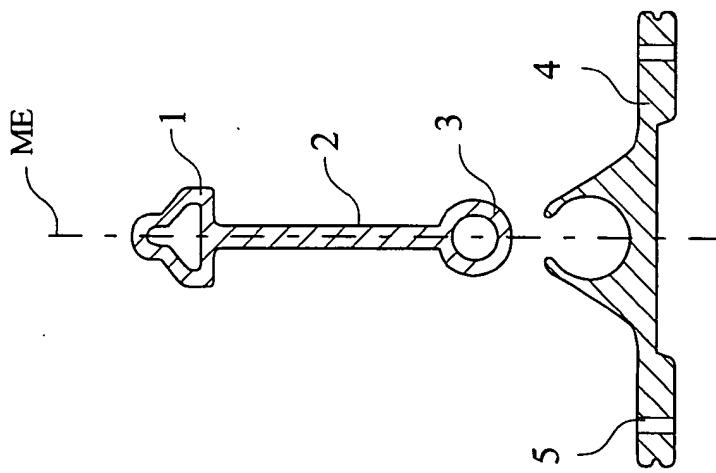


Fig.3a

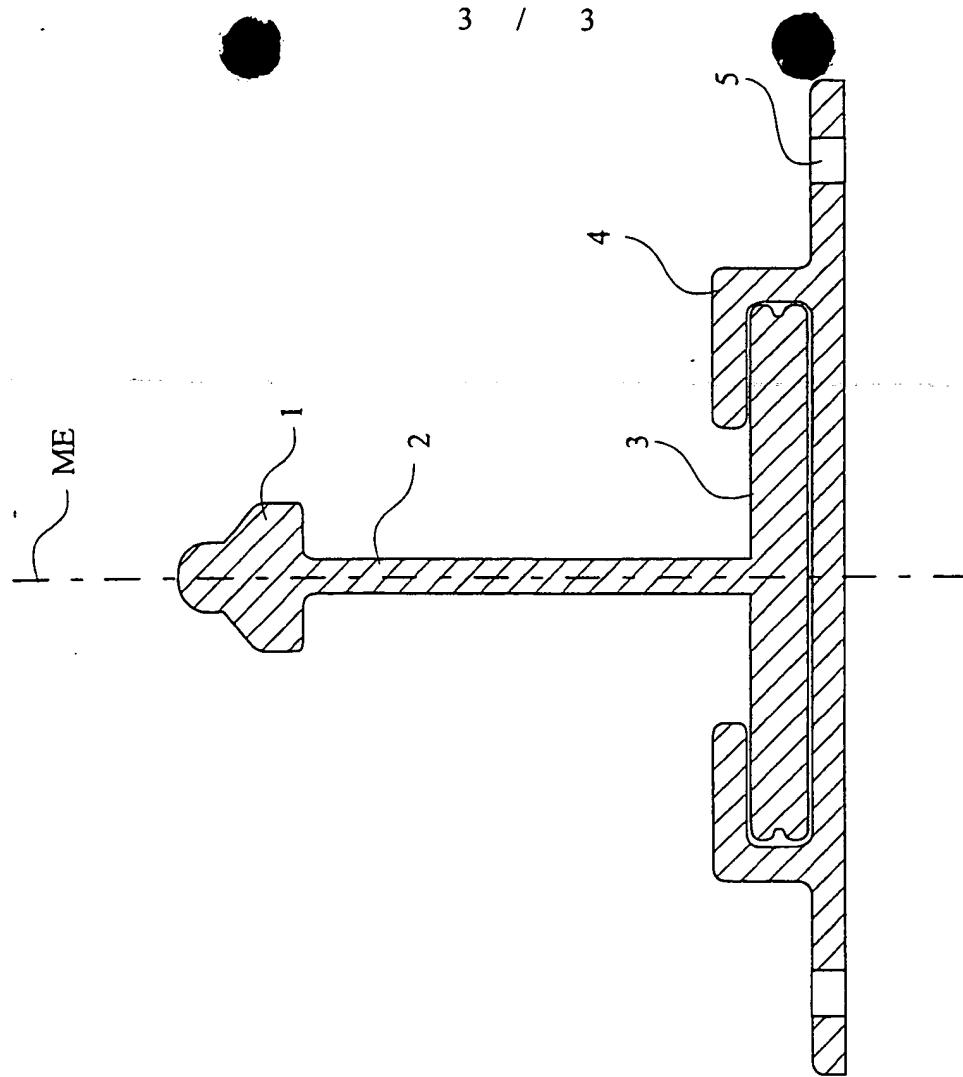


Fig.2

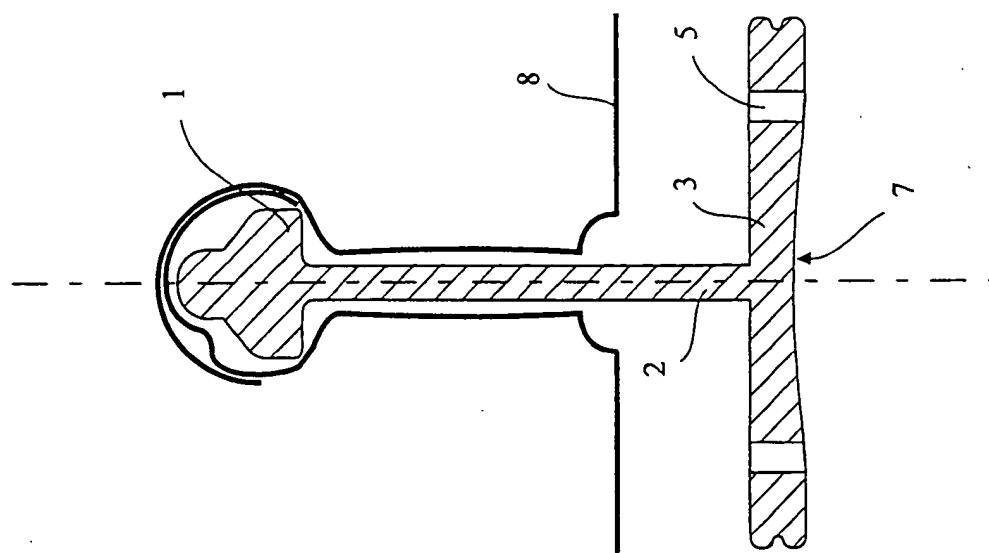


Fig.1

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 98/03002

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 E04D3/362 E04D3/363

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 E04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 368 043 A (WENDER) 3 March 1932 see page 1, line 89 - page 2, line 5; figures 5,6,9,10 -----	1-3,6
X	GB 2 167 101 A (KAISER ALUMINIUM EUROPE INC.) 21 May 1986 cited in the application see page 2, line 105 - page 3, line 4; figures 1,2,7,8 -----	11,12

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Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 368043	A	NONE	
GB 2167101	A 21-05-1986	DE 3442407 A NL 8502853 A, B,	28-05-1986 16-06-1986